What is Claimed is:

1. A method for the conversion of a coal-containing feedstock to a gas product comprising methane, comprising contacting said coal feedstock with a treatment gas comprising at least about 40 weight percent H_2 at a reaction temperature of at least about 600°C for a time sufficient to convert at least about 90 percent of the volatile matter in the coal-containing feedstock to methane and form a purified carbon product.

2. A method as recited in Claim 1, wherein said coal feedstock comprises low-grade coal having a sulfur content of at least about 2 weight percent.

3. A method as recited in Claim 1, wherein said reducing gas comprises at least about 99 weight percent H_2.

4. A method as recited in Claim 1, wherein said reducing gas is formed by steam oxidation of iron.

5. A method as recited in Claim 1, wherein said reducing gas comprises H_2 and CO.

6. A method as recited in Claim 1, wherein said reducing gas is formed by partial oxidation of carbon.

7. A method as recited in Claim 1, wherein said reaction temperature is from about 700°C to about 900°C.

8. A method as recited in Claim 1, further comprising the step of combusting at least a portion of said methane to generate electricity.

9. A method as recited in Claim 1, further comprising the step of combusting at least a portion of said methane in a combined cycle generator to generate electricity.

10. A method as recited in Claim 1, further comprising the step of reacting said purified carbon product and at least a portion of said methane in a boiler to generate electricity.

11. A method as recited in Claim 1, further comprising the step of diverting at least a portion of said treatment gas and combining said portion with said methane.

12. A method for the conversion of a coal-containing feedstock to a gas product comprising methane, comprising the steps of:

a) forming a H_2/CO treatment gas by the partial oxidation of carbon;

b) contacting said H_2/CO treatment gas with a coal feedstock at a reaction temperature of from about 700°C to about 900°C and for a reaction time sufficient to convert at least a portion of the volatile matter in the coal-containing feedstock to a product gas comprising methane;

c) recovering a purified carbon product from said contacting step; and

d) recycling at least a first portion of said purified carbon product to said step of forming a H_2/CO treatment gas.

13. A method as recited in Claim 12, further comprising the step of transporting at least a second portion of said purified carbon product to a boiler and combusting said purified carbon product.

14. A method as recited in Claim 12, further comprising the step of transporting at least a second portion of said purified carbon product to a boiler and combusting said purified carbon product with at least a portion of said methane.

15. A method as recited in Claim 12, further comprising the step of combusting at least a portion of said methane in a combined cycle generator.

16. A method for the treatment of coal, comprising the steps of:

e) forming a H_2/CO treatment gas by the partial oxidation of carbon;

f) contacting said H_2/CO treatment gas with a coal feedstock at a reaction temperature and for a reaction time sufficient to remove at least about 95 weight percent of the volatile matter in the coal-containing feedstock; and

g) recovering a purified carbon product from said contacting step.

17. A method as recited in Claim 16, further comprising the step of combusting at least a portion of said purified carbon product in a boiler.

18. A method as recited in Claim 16, further comprising the step of recycling at least a second portion of said purified carbon product to said contacting step.

19. A method as recited in Claim 16, wherein said contacting step converts said volatile matter to a methane-containing gas and wherein said step of combusting comprises combusting said methane-containing gas with said purified carbon product.

20. A method as recited in Claim 16, further comprising the step of combusting at least a portion of said methane in a combined cycle generator.

21. A method for the manufacture of a high purity coke product, comprising the steps of providing a coal feedstock having a sulfur content of at least about 1 weight percent and contacting said coal feedstock with a gas stream comprising hydrogen gas for a time and at a temperature sufficient to form a coke product having a sulfur content of not greater than about 0.1 weight percent.

22. A method as recited in Claim 21, wherein said coal feedstock has a sulfur content of at least about 2 weight percent.

23. A method as recited in Claim 21, wherein said gas stream comprises at least about 99 weight percent hydrogen gas.